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## Burlap Bands as a Sampling Technique for Green Anoles (*Anolis carolinensis*) and Other Reptiles Commonly Found on Tree Boles

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A variety of methods have been used to study lizard populations including rubber bands, active searching and noosing (Campbell and Christman 1982; Karns 1986; Simmons 1987), pit-fall traps (Fair and Henke 1997; Moseley 2004; Sutton et al. 1999), glue boards (Bauer and Sadler 1992; Downes and Borges 1998; Durtsche 1996; Moseley 2004; Whiting 1998), extraction by hook (Bedford et al. 1995), conspecifics as bait (Zani and Vitt 1995), crickets as bait (Durden et al. 1995), refuge tubes (Moseley 2004; Strong et al. 1993), and a water-spray method (Estrada-Rodriguez et al. 2004). All of these can be used to capture lizards with varying degrees of effectiveness depending on the species, but in some cases they result in lizard mortality or stress. For example, in the southeastern United States many traps (pitfalls, glue boards, etc.) that capture anoles are frequented by red imported fire ants (*Solenopsis invicta*) that prey on captive lizards (K. Moseley, pers. comm.). Also, lizards may die before traps are rechecked or may go for extended periods without food. Likewise, techniques such as removing bark from dead wood alter the local habitat.

Burlap bands are a simple, inexpensive, and effective way to catch or monitor bole-active lizards, and may be useful for sampling other herpetofauna. Burlap bands have been used to monitor insect pests occurring in orchards (Mizell and Schiffhauer 1987; New 1967) or to simulate bark where insects hide in both hardwood (Campbell and Sloan 1977) and pine (Horn 2000) forests. Because burlap bands often harbor insect prey and serve as a refuge from predators or adverse climatic conditions, they may be effective at sampling a number of arboreal lizard species. Herein, we describe our observations of Green Anoles (*Anolis carolinensis*) and other herpetofaunal species beneath burlap bands used for monitoring insects in mature pine forests in the southeastern Coastal Plain.

Our study plots were located on the Savannah River Site, a National Environmental Research Park in the Upper Atlantic Coastal Plain of South Carolina, USA. Stands consisted of loblolly pine (*Pinus taeda*) ca. 50–55 years in age in well-drained upland soils. We placed burlap bands (Fig. 1) around mature pine trees that had been scraped to remove the outer bark at a height of 1–1.5 m. Bands were 1 × 1 m pieces of burlap fabric folded in half and sewn along the fold ca. 3 cm from the folded edge. A 1.5 m-long piece of cotton rope was threaded through the fold and tied around the tree to hold the band in place (Fig. 1). Burlap bands were checked by untying the rope and slowly pulling the burlap away from the tree while walking around the tree and examining the bole underneath.

On 19 October 2004 and 20 April 2005 we monitored 240 burlap bands spaced ca. 50 m apart throughout 16 10-ha plots (15 bands per plot). It took ca. 8 h to check all 240 burlap bands on each sampling date. We selected these dates to coincide with Moseley's (2004; see below) sampling periods in previous years on the same plots so we could compare our results to his. Burlap bands were always in the field, and data reported here are from two days of observation following long intervals without checking bands. We collected 45 Green Anoles of all age classes, averaging one anole for every 10.6 bands checked. We also observed other species beneath bands such as Eastern Fence Lizards (*Sceloporus undulatus*) (N = 7), a Gray Tree Frog (*Hyla chrysoscelis*) (N = 1), a juvenile Black Ratsnake (*Pantherophis obsoleta*) (N = 1), and Broad-headed Skinks (*Eumeces laticeps*)



FIG. 1. Burlap band used for sampling arboreal insects and herpetofauna on pine tree boles at the Savannah River Site near Aiken, South Carolina.

(N = 2). Skinks have also been noted under burlap bands on both pine and hardwood trees in a nearby forest on the Savannah River Site (W. Gibbons, pers. comm.).

Green Anoles are commonly encountered in the southeastern U.S., yet it is unclear whether existing sampling techniques represent actual population levels. For example, Greenberg et al. (1994) conducted a study in Florida scrub habitat using pitfall and funnel trap arrays to assess their relative effectiveness for capturing local herpetofauna. They captured a total of 38 anoles during a 13 month period.

Recently, Moseley (2004) sampled herpetofauna (using pitfalls, refuge tubes, and glueboards) on the same plots used in this study and captured a total of 111 Green Anoles during 14 trap-days in October 2002 and 24 trap-days in April 2003. Glueboards (N = 96) resulted in 1.97 anoles captured/trap-day, pitfall trap arrays (N = 12) resulted in 0.63 anoles/trap-day, and refuge tubes (N = 192) resulted in 0.32 anoles/trap-day. In comparison, we averaged 22.5 anoles/observation-day using burlap bands. We acknowledge limitations in these comparisons because varying methods sample the local community differently. However, our data show that burlap bands can be an efficient technique for targeting specific species such as Green Anoles and other arboreal lizards.

Refuge tubes are similar to burlap bands in that they are non-destructive, but refuge tubes on tree boles were not as successful in attracting anoles (K. Moseley, pers. comm.). Unlike pitfall traps and glueboards that can harm or kill captured lizards, burlap bands were non-destructive, i.e., lizards were not captured until observed, thus avoiding mortality, stress, or environmental hazards. For example, glueboards resulted in 25% mortality of anoles captured in October 2002 and 41% mortality in April 2003. The increased mortality in April was likely because of increased temperatures and fire ant activity (K. Moseley, pers. comm.).

Burlap bands provide an inexpensive monitoring tool for studies of lizards and other reptiles. Although our sampling was limited to pine forests in South Carolina, this technique should be useful for sampling bole or canopy active lizards in other forest types. This might be especially true in tropical regions where burlap is widely available and sampling may be sporadic. More research is needed to determine the efficiency of this technique for collecting different species under varying conditions and whether observations beneath burlap bands reflect actual lizard abundance.

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